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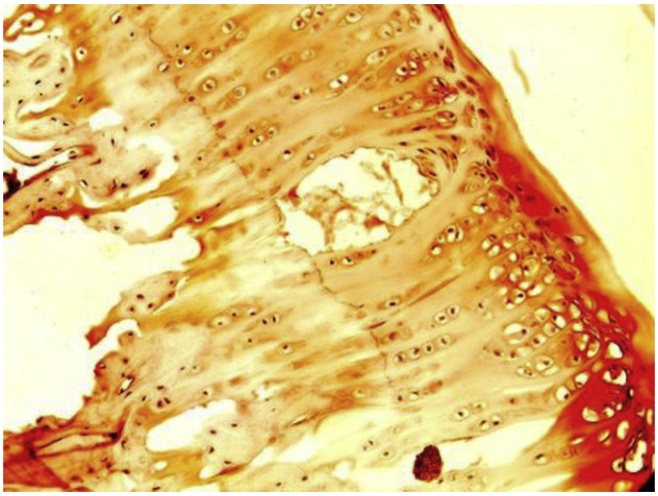
LESIONS AT THE JUNCTION BETWEEN UNCALCIFIED AND CALCIFIED CARTILAGE ZONES DURING THE DEVELOPMENT OF OSTEOARTHRITIS

Z. Zhang [†], J. Molligan [‡], J. Beckett [§], L. Schon [‡]. [†] *Medstar Hlth. Res. Inst., Baltimore, MD, USA;* [‡] *Union Mem. Hosp., Baltimore, MD, USA;* [§] *Saint Louis Univ., St. Louis, MO, USA*

Purpose: Characterization of lesions developed at the junction between the uncalcified and calcified cartilage zones in the joints with excessive running-induced osteoarthritis (OA).
Methods: An excessive running protocol (55 km in 6 weeks) was used to induce osteoarthritis in the knees of Wistar rats (20 weeks old by the end of the study). Knee joints of the running (n=6) and control (n=6) rats were dissected for histology. Tissue sections were stained with Safranin O and graded for the severity of OA in the running rats. In the knees of running rats, OA was confirmed by cartilage surface irregularity, depletion of aggrecan from the matrix and significantly increased Mankin's score. On tissue sections, the incidences of a “cyst-like” lesion at the junction between uncalcified and calcified cartilage zones in both osteoarthritic and control knees were calculated. Immunohistochemistry of types II and VI collagen, MMPs 9 and 13, VEGFR was performed to characterize the lesion.
Results: At least one cyst-like lesion was found in 5/6 OA knees in the running rats, but only 2/6 in the control rats. Some OA joints had multiple cysts at the junction between uncalcified and calcified cartilage zones. The lesions in different joints varied greatly in size, shape and distance to the cartilage surface. They rarely penetrated through the tidemark and this made most of the cysts flat facing the tidemark (Fig, Safranin O staining). Cysts appeared expanding into the uncalcified cartilage and a few had openings at the cartilage surface. Most of the cysts were void, but some with matrix residuals. No chondrocytes were found inside of the cysts. The cysts were either located in or neighbored with the areas of pre-oteoglycan depletion. The margin of the cysts was high intensity of type II collagen. There was type VI collagen staining in the cyst content, but not on the margin. Not the matrix immediately surrounding the cysts, but in the neighboring areas were MMP13 positive. Chondrocytes around the cysts were not stained with VEGFR and MMP9.
Conclusion: This study described and characterized a cyst-like lesion at the junction between the uncalcified and calcified cartilage zone in excessive running induced osteoarthritic knees. The transition from uncalcified cartilage to calcified cartilage at the tidemark represents a major alteration of the biological and mechanical properties of articular cartilage. The cyst-like lesion at the junction between uncalcified and calcified cartilage zone has not been directly linked to the pathology of OA. Its location, however, suggests it could play an important role during the development of OA.



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CROSS-SECTIONAL AND LONGITUDINAL ASSOCIATIONS BETWEEN SYSTEMIC AND SUBCHONDRAL BONE MINERAL DENSITY AND KNEE CARTILAGE THICKNESS IN OLDER ADULTS WITH OR WITHOUT RADIOGRAPHIC OSTEOARTHRITIS

C. Ding [†,‡], Y. Cao [†], O. Stannus [†], D. Dore [†], B. Antony [†], G. Jones [†]. [†] *Univ. of Tasmania, Hobart, Australia;* [‡] *Monash Univ., Melbourne, Australia*

Purpose: To investigate cross-sectional and longitudinal associations between systemic bone mineral density (BMD), subchondral BMD (sBMD) and knee cartilage thickness in older adults with or without radiographic osteoarthritis (ROA).
Methods: A prospective cohort of 158 randomly selected subjects (mean 63 years, 48% female) including 69 non-ROA and 89 ROA subjects were studied at baseline and 2.7 years later. Knee cartilage thickness at medial tibial, lateral tibial, femoral and patellar sites was semi-automatically determined from T1-weighted fat suppressed magnetic resonance imaging (MRI). Total body, total hip, spine BMD and medial and lateral tibial sBMD were measured by dual energy x-ray absorptiometry (DXA).
Results: Cross-sectionally, total body, total hip, spine BMD and/or lateral sBMD were significantly and positively associated with femoral, lateral tibial and/or patellar cartilage thickness in subjects with ROA after adjustment for potential confounders. Longitudinally, total body BMD was associated with increased femoral cartilage thickness (β: 0.33 mm per g/cm2, 95% CI: 0.13, 0.54), spine BMD was associated with increased femoral and lateral tibial cartilage thickness (β: 0.26 mm per g/cm2, 95% CI: 0.10, 0.42; and β: 0.18 mm per g/cm2, 95% CI: 0.02, 0.35, respectively), and medial sBMD was associated with increased medial tibial cartilage thickness (β: 0.44 mm per g/cm2, 95% CI: 0.01, 0.86) in subjects with ROA. There were no significant associations between BMD and cartilage thickness in subjects without ROA.
Conclusions: Both systemic and subchondral BMD are associated with increased cartilage thickness in subjects with ROA, suggesting BMD may play a protective role against cartilage loss in knee OA.

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ASSOCIATIONS BETWEEN MEASURES OF OBESITY OVER 10 YEARS AND PATELLA CARTILAGE IN A POPULATION-BASED COHORT OF YOUNG TO MIDDLE AGED, ASYMPTOMATIC WOMEN

A.J. Gunardi [†], S.L. Brennan [‡,§], Y. Wang [†], F.M. Cicuttini [†], J.A. Pasco [‡,§], M.A. Kotowicz [‡,§], G.C. Nicholson [‖], A.E. Wluka [†]. [†] *Monash Univ., Melbourne, Australia;* [‡] *Univ. of Melbourne, Melbourne, Australia;* [§] *Deakin Univ., Geelong, Australia;* [‖] *Univ. of Queensland, Queensland, Australia*

Purpose: Osteoarthritis most commonly affects the patellofemoral compartment of the knee, being a major cause of pain and disability. The structural changes that evolve prior to the onset of symptoms can be visualised using magnetic resonance imaging (MRI). There is little known about the role of obesity on the early structural changes in the patella cartilage in younger, asymptomatic adult females.
Methods: 160 asymptomatic women (20-49years) participating in the Geelong Osteoporosis Study underwent knee MRI between 2006-8. Weight and body mass index (BMI) were measured 10 years prior (1994-7, baseline) and at the time of the MRI (current) with change over the period calculated (current-baseline). The relationships between the measures of obesity and patella cartilage volume and defects were examined.
Results: After adjustment for age and patella bone volume, there was a reduction of 13 (95% CI -25.7, -0.55) microliters (mL) in patella cartilage volume for every 1 unit increase in current BMI and reduction of 27mL (95% CI -52.6, -1.5) per BMI unit increase over 10 years (p=0.04 for both). There was no significant association between baseline BMI and patella cartilage volume (p=0.16). Increased baseline and current weight and BMI were associated with increased prevalence of patella cartilage defects (all p<0.001).
Conclusions: Obesity and weight gain over midlife are both associated with detrimental structural change at the patella in young to middle aged healthy women without clinical osteoarthritis. Maintaining a healthy weight, avoiding obesity and weight gain in younger asymptomatic women may be important in the prevention of patello-femoral osteoarthritis.

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USE OF LOW DOSE ASPIRIN IS ASSOCIATED WITH REDUCED MEDIAL TIBIAL CARTILAGE LOSS IN SYMPTOMATIC OSTEOARTHRITIS: DATA FROM A COHORT STUDY